

## REMARKS/ARGUMENTS

### Comments: General

I have followed the proscribed procedures of 37 C.F.R. 1.121, Manner of making amendments in preparing my response.

The errors in figures 2B and 3-6 have been amended according to the Office Action. Drawings 7-11 have been added for purposes of explanation and teaching.

My arguments as to why my ideas are unique and valuable and should be granted is based on use and measurement of Optical Phenomena which are commonly called phosphorescence, luminescence, and incandescence. These phenomena are light that can be visible or invisible to the naked eye. The output spectrum of the Optical Phenomena determines which wavelengths must be measured. The following words are now added to the disclosure because I believe they are useful definitions that help to explain the invention and its methods.

I do not claim any particular kind of Optical Phenomena mechanism, because most of the phenomena are naturally generated and the selection of which phenomena to employ is left to the ultimate user.

**Optical Phenomena** -in the context of this patent application include one

Of: Incandescence: light emission due to temperature (e.g. light bulbs) Luminescence

(Scintillation): light emission due to causes other than temperature. These causes could be electromagnetic radiation, electric fields, chemical reactions, and bombardment by sub-atomic particles, or mechanical action. If the sub-atomic particle is an electron, it is called cathodoluminescence. If the mechanical action is breakage or shattering, it is called triboluminescence. if one form of luminescence induces another, it is called "luminescence luminescence"

**Fluorescence:** luminescence that ceases within 10 nanoseconds after the stimulus has ceased. While phosphorescence luminescence continues for more than 10 nanoseconds after the stimulus has been cutoff.

### **Measurement of Optical Phenomena.**

Measurements of Optical Phenomena include measurement of wavelength frequency (Hertz), wavelength (Angstroms), power (Watts), and intensity (lumens). All photometric concepts are based on the concept of a standard measure called a "candle" The ratio of the candle power of a source to its area is called the luminance of the source. The power of the luminance of the Optical Phenomena of the sensors at a particular frequency or band of frequencies can be measured by several common and widely known techniques.

One common and widely known technique is to use a photoresistor or photodetector which are semiconductor devices that convert light signals to a voltage or current. The output voltage or current from the photodetector device is integrated, averaged, digitized and otherwise manipulated to provide the measurement parameter.

Review of over a hundred patents found no patent that teaches the use of Optical Phenomina for inspecting the health of conduits.

There are many patents presented in the disclosure and amendment that use end to end tests usually with electricity (Born, et. al, De Angelis, Boenning, Morris, Watkins, Starke, Baldwin, Khuri-Yakub, Runner, Shanley, May, Johnson, etc.) and some times end-to-end monitoring of light in a conduit to check end to end for continuity (Born).

Use of Optical Phenomena is consistently missing. For example, Starke et al US Patent No. 4,480,480 Claim 1 claims use of prestressed light conduits for monitoring physical conditions, using breaking of the light conduit as the means for detecting a structural deformation.

My invention uses change in a Moire Fringe, or loss of light due to change in radius, or other Optical Phenomena, such as change in spectrum if a Prism is used.

**None of these patents used measurement of Optical Phenomena other than check to see if a light path is established end-to-end.**

It is important to know that one reason for the federal funding of this work was that end to end tests using electricity are sometimes dangerous especially in flammable or explosion prone environments.

My invention in the application did not preclude use of electrically conductive and electrical stimulation. Any energy that causes the Photo Phenomena is OK. However,

my invention does not require use of end-to-end measurement of electricity for detection or diagnostics. In fact, my invention does not require end-to-end measurements at all, as the amount of Optical Phenomena can be measured at one point much the same as reading the pressure on a balloon which is equalized along the surface.

The Examiner referenced additional patents, I added those and a few more Patents that have been granted since the application.

Because of these new Patents I expanded on the "Limitations of Prior Art" In the specification and in the Preferred Embodiment I added the process control aspects of using stimuli and getting a photometric measurement of the Optical Phenomena. This is an old concept

Note: my application precluded allowing end-to-end electrical conductivity as used in the art of Bond and others because of concern for safety hazards.

**A. Claim rejection**

Examiner's Page 6, Item 9 "Claims 1 – 41 do not meet the enablement requirement under 35 U.S.C. 112 "

I have responded to this with additional drawings and discussions of how the claims relate to using measurement of Optical Phenomena. I expanded the explanation with definition of technical terms and example(s) in Preferred Embodiment

I think it is fair and just to argue that one skilled in the art of optical physics and/or optical sensors (to which it pertains) can use the Patent disclosure to make create a system described herein – to make use of the invention. (We have confirmed this with at least one outside person skilled in the art of optical physics.).

Question: Is it proper to add an example of each type of sensitized medium?

## **Response to Specific Rejections**

### **Examiner's Page 6 Item 9 Claim 1 – use of “weighting parameters”**

Claim 1 has been reworded to eliminate “weighting factors” from the text, deferring to an adaptation of the wording of Runner's Patent.

I have removed the weighting parameters and use “calibration transform” more commonly used which is just a linearization formula for accurate conversion to measure values (e.g. inches, pounds, etc.)

### **Examiner's Page 13, item 12**

Rejection of claims 2,4, 7-9, 11, 13, 14, 15, 16, 19, 21-26, 31, 32, 35 and 38 based on U.S. Patent No. 6, 512,444 to Morris, Jr. et al

### **Regarding Claim 2**

Claim 2 has been worded so as not to infringe on the U.S. Patent of Morris et al by not requiring at least one electronic temperature sensor as found in Morris, column 9, lines 13-16, This because we can use an direct optical measurement of temperature reflectance by Gallium Arsenide crystals) and I have modified by claim by not including in my amended claim “having at least one programmed microcontroller” because the optical response can be measured with analog signal (like a VU meter) without programming. The use of a microcontroller will depend on the person who uses the teaching of this patent.

Note: A microcontroller or processor is ubiquitous in today's sensor technologies and has been moved to the preferred embodiment.

I have eliminated reference to baseline parameters range and variance in the preferred embodiment.

Watkins patent [5,862,030] teaches using a distributed conductive over- temperature sensing portion having a positive temperature coefficient of resistivity which increases with temperature sufficient to result in a switching temperature. Said Watkins ' patent also teaches use of electricity with a mechanical damage (chafing) sensing portion comprised of a strip disposed in the sheath in a mechanical damage sensing pattern which like said Born's patent becomes damaged or open upon mechanical damage of the sheath before the bundle of conductors are damaged. Watkin's patent does not teach a means to perform detection of mechanical damage without use of an electrically conductive sensor material.

My patent differs and improves on Watkin's patent by using the measurement of florescent light intensity that does not require a positive temperature coefficient of resistivity.

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**Arguments in rebuttal of Rejection Due to Prior Art With respect to Morris, et al.**

Most important is that the set of sensors of Morris's claims are not based on Optical Phenomena measurement rather that the sensitized media act as transmission lines for transmitting conducted electricity (Morris, column 8, lines 44-60)

Claims 7, 9, 11, should not be rejected based on the Morris patent because these claims refer to an optical temperature sensor which is not electrically conductive (we used measuring the Optical Phenomena of change in refraction by a surface of Gallium Arsenide which changes optical characteristics on change of temperature)

Claims 8, 9, 11, should not be rejected based on the Morris patent claims of a temperature sensor, because these claims do not refer to a sensitized medium exhibiting Optical Phenomena that is a temperature sensor, rather a temperature sensor as part of the monitoring device (presumably for purposes of temperature compensation of analytical results, and such as temperature sensor has long been in the public domain.

In addition I argue that my claim 18 should be allowed as the Morris patent does not include a visual indicator.

**Examiner's Page 16 - With respect to the U.S. Patent No. 5,245,293 granted Runner**

The teaching of using monitoring of the dielectric changes of resistance and capacitance (Abstract) an adhesive bond is not relevant because my claims are for non-electrical measurements based on optical measurement whether adhesively bonded or not.

**Examiner's Item 14 beginning on Page 16 – rejecting claims 10, 20, 27, 30, 33, 24 and 36 in view of US Patent 5,245,293 Runner and U.S. Patent No. 6,265,880 Born, et al.**

Claims 10, 20, 27, 30, 33, 24 and 36 should NOT be rejected because the sensitized media of these patents is electrically conductive; in particular using measurement of dielectric (capacitance and resistance) properties (Runner and Born).

Further, the Born's inventions Apparatus Claim 8 requires "a means for transmitting and a means for receiving said transmitted optical signal from said medium" (End –to – end test).

With respect to the apparatus of Born and illustrated in Claim 8 – my invention does not require an end to end test and thus does not require a wave guide because the measure of the intensity of light parameter generated by the florescent material (doping) can be done at one end.

Further, my invention does not require use of Time Domain Reflectometry as direct measurement proportional to the light response is used. Until my invention it was not obvious to anyone

**The examiner's Item 15, Page 16 Rejecting Claims 3 and 16 based on patents of Shanley, Morris, Runner and Born**

Claims 3 and 16 should be allowed because the inventions by Morris, Jr. et al, Runner and Born, as Patented above, even in view of Patent 5,574,213 to Shanley because we specifically use a florescent dye,. With respect to Shanley's patent we only incidentally use the dye as a leak detector, (it might leak), rather our use is a florescent medium whose measured light intensity indicates corrosion, erosion or other damage as either the light leaks outward from the corroded area, or is excited causes effervescent florescence when light spectrum enters inwardly.

**Examiner's Item 16, Page 18, Rejecting Claims 5 and 12**

Claims 5 and 12 should be allowed to stand without deletion of the use of piezoelectric material (it requires electrical conductivity). My patent does not allow forming of an end-to-end circuit but the piezoelectric discharge given off when touched can excite the photosensitive medium exciting an Optical Phenomena.

Further because the prior art does not include sensing vibration using a "curly fiber" which emits more light the more it changes in amplitude as it vibrates. – and we do not need to use a piezoelectric sensitized medium.

Boenning's Patent is not relevant as it assumes electrical conductivity.

**Examiner's Item 17, Page 19 - Rejecting my claims 6 and 28**

I submit that my claims (as modified) should not be rejected because my invention, as the examiner states, but Morris and Runner do not include EMI; and the teaching of Born uses conducted electromagnetic waves (column 5, lines 55-56)

My invention claims use of EMI to cause an Optical Phenomena

My invention claims use of electromagnetic waves to excite an Optical Phenomena – e.g. as with Neon gas fluorescing.

My invention performs corrosion / erosion detection by measuring ingress of light through the porosity of the corroded coating which changes the measurement of the light intensity and spectral content depending on the source of the light entering the fiber; or the egress of light through the porosity of the corroded or eroded coating.

**Examiner's Item 18, Page 20 Rejection of Claim 29**

I removed reference in my claim regarding reflectometry which is not needed with Optical Phenomena measurement and thus Claim 29 as modified should not be rejected because while Runner, and Born use electrical conductivity required by TDR to locate damage, my invention does not and uses light intensity measurement.

The Patent No. 5,271,274 to Khuri-Yakub uses acoustic waves for conductivity which my claim 29 (as modified) does not, rather my claim is that the acoustic waves are used to excite an Optical Phenomena – using the same mechanism for distortion as caused by stress and strain pressures on a flexible membrane

**Examiner's Item 19, Page 21 Rejecting Claims 15, 39, and 40 by reference to US Patent 5,712,934 Johnson**

I submit that Claims 15, 39, and 40 should not be rejected because Johnson uses infra-red light (incandescent light) which my invention does not require. Further, Johnson does not teach the use of measurement of induced florescence / phosphorescence of the chemical dope which is a key element of my invention.

The U.S. Patent No. 5,712,934 granted to Johnson disclosed an optical sensor comprising a light source, light detector, and signal generator and an optical fiber extending between the light source and the detector. The optical fiber includes a sensing length comprising a return bend in the fiber, where the return bend has a bend radius less than or equal to 2.5 times the radius of the optical fiber. (Abstract)

My innovation improves on Johnson's patent by:

NOT requiring a return bend in the fiber, because a linear unbent fiber is sufficient, albeit not necessarily unbent.

NOT requiring a fiber between the light source and the detector; because my invention requires a measurement device at one end only.

In one embodiment, my invention DOES NOT require a light source. An ambient light being adequate for inducing phosphorescence emission for measurement.

Further, Johnson requires use of both a transmitter and receiver device for end-to-end measurement, while my apparatus (as documented in amendment) is single ended.

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The disclosure of U.S. Patent No. 5,245,293 to Morris, Jr. et al, teaches "a fault sensing electrical wire utilizes one or more sensor strips which provide an impedance change when the wire is subject to over temperature condition or mechanical damage of the wire." (page 1 Abstract)

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The patent claim No 1 line 3 states "at least one fault sensing electrical wire". Further that there is at least one (metal wire) sensor strip deposited in the insulation along substantially the length of the wire the sensor strip conductor for diagnostic purposes (column 4, lines 50 – 58),

The claim #1 states the invention requires the sensor having a positive thermal coefficient.

The patent further claims a device comprising at least one programmed microcontroller or other processor for the purpose of acquiring sensor information from a set of sensors and a sensitized medium (column 5, lines 59-64), conditioning and normalizing the sensor information based on parameters and environmental condition of the conduit (column 10, lines 5-15), and for processing normalized information to provide an output signal indicative of the diagnostic condition of the conduit it monitors (column 7, lines 30-33 and 51-53).

Any person familiar with resistive thermal response from electrical current would agree Morris's patent requires use of electricity.

My invention improves on Morris's patent by:

a) My invention sensor mechanism is optical response, NOT requiring electrical excitation, the optical response being able to be measured by the output of a photodetector, without direct electrical coupling. The measurement of the intensity of the output (light) signal indicative of the diagnostic condition of the conduit it monitors.

My invention measures the distance from the photodetector to the fault using only intensity of the output (phosphorescent light) signal which is proportional to the distance from the point of test end of the to point of damage.

My invention is able to measure the optical response from a single point.

The disclosure of U.S. Patent No. 6,265,880 by Born et al discloses use of a length of electrical conducting medium (such as a wire) along the outside of a conduit to detect mechanical damage (chafing) using sensors based on a conductive wire, waveguide, fiber optic cable, or a tube that holds a fluid under pressure. (Abstract). Further Born's patent requires measuring end-to-end integrity of the sensing element.

My invention differs from and improves on the Born et al Patent because it uses phosphorescent / effervescent doping of the polymer fiber, or phosphorescent / effervescent doping of a glass fiber, or phosphorescent / effervescent doped buffer cladding a fiber optic core; specifically a new mechanism that is none of a conductive wire, a waveguide, fiber optic cable, or a tube that holds a fluid under pressure.

Further, my invention does not rely or need a fiber optic cable as a component of the sensor.

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Further, my invention does not require end to end measurement, one end being sufficient to measure the strength of the florescent emission.

The disclosure of U.S. Patent No. 4,988,949 by Boenning uses a layer of semiconductor material positioned in surrounding relation for detecting mechanical damage (chafing) on electrical cables against grounded structures under constant electrical signal monitoring using an electrical signal from the semiconductor material (Abstract).

My invention differs from Boenning's patent by teaching a method using optical measurement of intensity florescence rather than Boenning's method of electrical measurement.

### **Regarding the Conclusions of the Examiner**

There is no prior art exploiting use of Optical Phenomena to avoid the use of end-to-end electrical circuits, which represent a hazard in flammable and explosive environments.

My application of 2000 clearly states use of Optical Phenomena by the Words about excitation of optical phenomena.

The lack of prior art in the prior art opens new opportunities exploited by my patent inventions

U.S. Patent No. 5,862,030 to Watkins Jr, et al teaches electrical safety device with a conductive polymer sensor.

A reading of the patent clearly states that the polymer is electrically conductive end-to-end. My invention improves on this by removing the safety hazard. (See discussion in the previous section for details.)

U.S. Patent No. 6,392,551 to De Angelis teaches a synthetic fiber cable with a temperature sensor.

A reading of the patent clearly states that an electrically conductive wire is used. (See discussion in the previous section for details.)

U.S. Patent No. 6,286,557 to May teaches a sheath including a sensitized media strip. A reading of the patent clearly states that electrically conductive wires are used. (See discussion in the previous section for details.)

U.S. Patent No. 5,177,468 to Baldwin et al teaches a conduit liner monitor.

A reading of the patent clearly states that the monitor monitors electrically conductive wires. Optical Phenomena are not used. (See discussion in the previous section for details.)

U.S. Patent No. 4,840,480 to Starke et al teaches a light conduit arrangement for monitoring a physical condition of a structural part.

A reading of the patent clearly states that the patent does not teach monitoring conduits, and that monitor monitors using a prestressed light conduit as sensor with end to end measurement with a light source and light receiver).. The antecedent Claim 1 requires breaking a light conduit.

Again, Optical Phenomena are not used. (See discussion in the previous section for details.)

Electroactive Polymers 1: Piezoelectric Materials, teaches the common type of piezoelectric materials.

The reference does not consider use of the electricity generated by the piezoelectric material to cause fluorescence which is the purpose in this patent application.

**Respectfully submitted,**

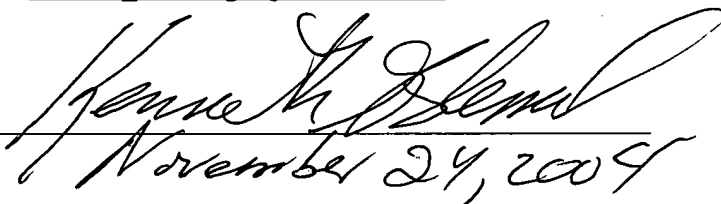
**Kenneth G. Blemel**

6022 Constitution Ave NE  
Albuquerque, NM 87110

Ph: 505-255-8611

E-mail: [kenneth\\_blemel@mgtsciences.com](mailto:kenneth_blemel@mgtsciences.com)

By



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Attachments:

Information Disclosure Statement, Item #5

Amended Drawings Replacement Sheets